Education

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FEATURE ARTICLES

TECH SHEETS

SPECIAL ANNOUNCEMENT

Apple and Adaptive Technology for Individuals with Disability

Apple's Worldwide Disability Solutions Group focuses on several goals:

- Increasing awareness of the computer solutions available to children and adults with disability.
- Providing access to information on how to implement computer solutions at home, at school, and in the workplace.
- Creating a national network of partnerships with agencies and organizations to assist children and adults with disability in the use of personal computer technology.
- Developing accessible personal computers for people with disability.

The Worldwide Disability Solutions Group develops a wide variety of materials that describe how personal computers can constructively influence the experience of being disabled. Among the resources available are the following:

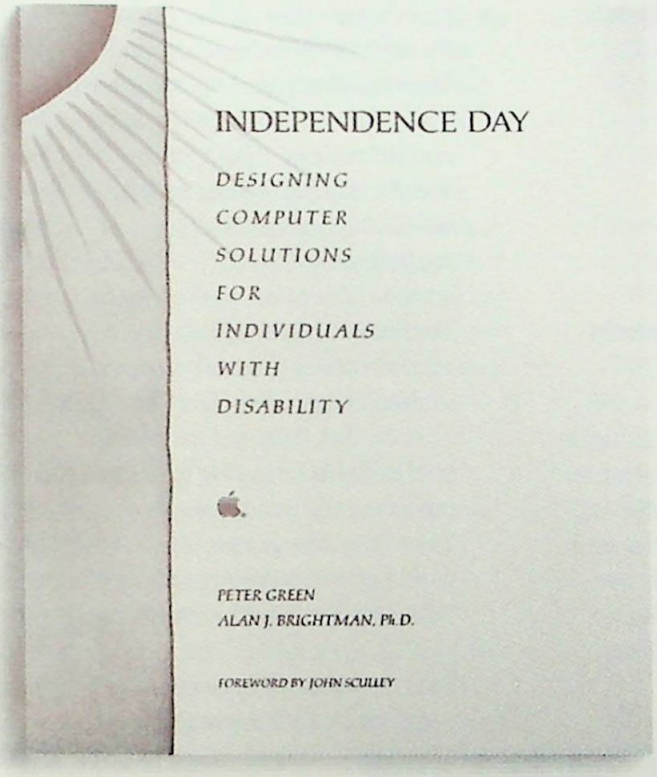
- SOLUTIONS database. The Worldwide Disability Solutions Group communicates regularly with nearly every manufacturer and organization that produces technology products and related information of importance to individuals with disability. The results are organized in a database that describes more than 1,000 adaptive devices, software programs, and disability-related organizations, publications, and networks. The SOLUTIONS database is updated regularly in response to the number of new products and services available to computer users with disability. It is available on the AppleLink® network, as a HyperCard® stack, and on CD-ROM. (To get the HyperCard stack or the CD-ROM, send an AppleLink memo to SPECIAL.ED.)
- *Apple Computer Resources in Special Education and Rehabilitation*. This 400-page volume is a comprehensive guide to Apple-compatible hardware and software products for individuals with disability. It includes descriptions of more than 1,000 products, publications, and services that support individuals with disability who use Apple® computers. The first section focuses on hardware and adaptive devices that allow people with disability to use Apple computers for a wide range of applications. This is followed by descriptions of software applications and information resources (organizations, publications, networks, and directories) that are useful to children and adults with disability. For each of the products, publications, and services identified, the name of the company or organization and a telephone number are listed.

  An alphabetical listing of all the included products gives the name of the manufacturer and a reference to the location of the full product description. There is also an alphabetical listing of the more than 400 manufacturers whose products, publications, and services are described in the book, with the complete address and telephone number for each entry.

  Apple Computer Resources in Special Education and Rehabilitation is available from:

  DLM, Inc.
  One DLM Park
  Allen, TX 75002
  1-800-527-4747

- *Independence Day: Designing Computer Solutions for Individuals with Disability.* Peter Green and Alan Brightman, of Apple's Worldwide Disability Solutions Group, wrote



this book primarily for individuals with disability and for professionals in the fields of special education and rehabilitation. Available from DLM (at the address mentioned previously), it includes case studies and descriptions of selected adaptive products, and describes strategies and solutions for tailoring personal computers to meet individual needs and objectives. It also includes a foreword by Apple CEO John Sculley.

- SpecialNet. This is the nation's largest telecommunications service devoted to serving the needs of professionals in special education and rehabilitation. As part of the SpecialNet offerings, Apple's Worldwide Disability Solutions Group maintains the Apple Bulletin Board, an electronic "drop-in center" where individuals are encouraged to ask or answer questions, meet new colleagues, and learn about innovative technology solutions. The Apple Bulletin Board also provides SpecialNet subscribers with a convenient way to communicate directly with the Worldwide Disability Solutions Group. For additional information, contact:

GTE Education Services
SpecialNet, Suite 314
2021 K Street NW
Washington, DC 20006
(202) 835-7300

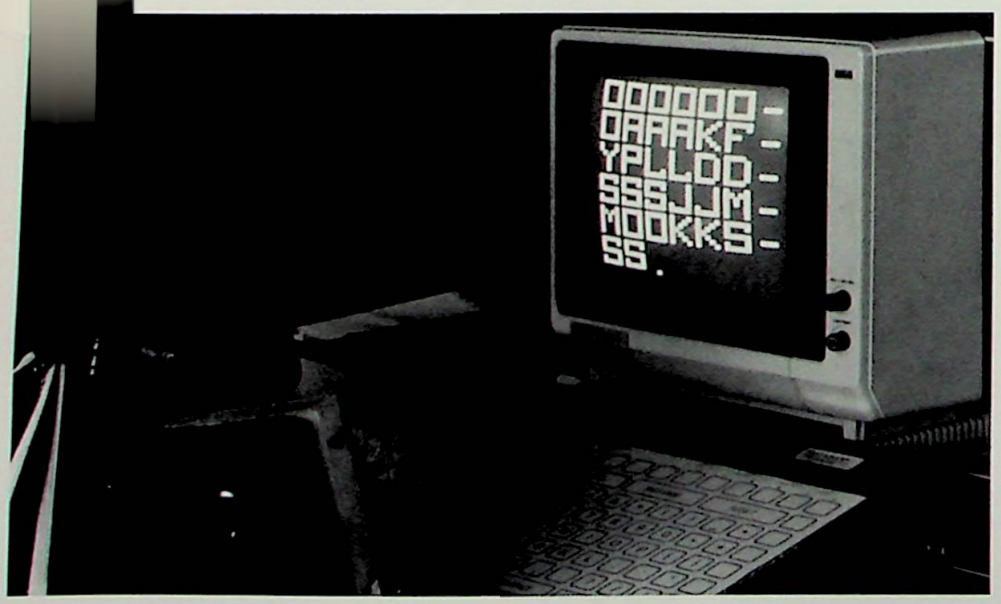
- National alliance. The Alliance for Technology Access (ATA), formerly called the National Special Education Alliance (NSEA), is a network of nonprofit resource centers that specialize in using computers to help individuals with disability. Alliance centers receive equipment support and extensive ongoing training from Apple, and provide training workshops, product fairs, individual consultation with families and teachers, and many outreach activities. Each ATA center is electronically linked, via AppleLink, with every other center, as well as with a variety of hardware and software manufacturers, including Apple's Worldwide Disability Solutions Group.

For information about the ATA center in your area, contact:

Foundation for Technology Access
1307 Solano Avenue
Albany, CA 94706
(415) 528-0747

Developing Accessible Apple Computers

The Worldwide Disability Solutions Group works closely with Apple's product development groups to ensure that the unique needs of children and adults with disability are appropriately considered in the design of all Apple products. The goal is to ensure that every Apple computer is fully accessible to every individual, regardless of disability. The adaptive features that follow have been incorporated in Apple computers.



- Easy Access. Easy Access is a standard system file that is included in the system software for all Macintosh® and Apple IIGS® personal computers. The program contains two features: StickyKeys and MouseKeys. These features are especially useful to people who have difficulty in typing with both hands on the keyboard, or manipulating the mouse.

The StickyKeys feature lets you type combination keystrokes without pressing the keys simultaneously. For example, ejecting a disk from the disk drive typically requires that users hold down three keys at the same time, a procedure that can be an obstacle for disabled users. The StickyKeys program overcomes the problem by letting you press each of the keys separately, instead of simultaneously.

To turn on StickyKeys, you press the Shift key five times. Once the feature is turned on, a small icon appears on the right side of the menu bar, indicating that you can now press command keys in sequence. To turn off StickyKeys, you press the Shift key five times again.

The MouseKeys feature lets you implement mouse movements using the numeric keypad located on the right side of the keyboard. You can press keys to click, drag, and perform all the usual mouse activities. Once MouseKeys is activated, the number keys on the keypad become mouse controls; the "8" key moves the mouse

cursor up, the "2" key moves it down, and so on. You can use a combination of StickyKeys and MouseKeys to perform operations such as Shift-clicking.

- CloseView is a Control Panel application that magnifies images displayed on the Macintosh screen by a factor of 2 to 16 times. It is included with Macintosh System Software Version 6.0 and later, and is activated by placing the CloseView icon in the System Folder. Modifications to the program are made via the Control Panel.

  Intended for users with visual disabilities, CloseView enlarges standard text characters as well as graphics. The program automatically follows the user's keystrokes and mouse movements without interfering with the application program. The location of the cursor in the enlarged character mode directly corresponds to its location in the standard character mode.

- Key-repeat elimination. Via the Control Panel, Macintosh and Apple IIGS computers can be adjusted to prevent unwanted (repeated) characters from occurring when a user with fine-motor or gross-motor difficulties unintentionally holds a key down too long.

Adaptive Technology Resources

Apple works with a number of organizations that provide valuable assistance in designing computer solutions for individuals with disability. Two of the most important are these:

- Trace Research and Development Center. Located in Madison, Wisconsin, this center is the foremost authority on using technology to help individuals with disability. In addition to developing adaptive tools, Trace maintains a large database of currently available adaptive products.

  Trace Research and Development Center
  S-151 Waisman Center
  1500 Highland Avenue
  Madison, WI 53705
  (608) 262-6966

- Closing the Gap. A national organization that provides training and information about adaptive computer technology, Closing the Gap publishes a bimonthly newsletter and sponsors an annual conference, where developers, consumers, and professionals can learn about computer strategies for individuals with disability.

  Closing the Gap
  P.O. Box 68
  Henderson, MN 56044
  (612) 248-3294

Intellimation Library for the Macintosh

The Intellimation Library for the Macintosh, the result of a partnership between Apple Computer, Inc. and Intellimation, serves two important purposes:

- It's a source of useful, tested, low-priced, curriculum-based software for higher education.
- It provides a way for educators to market the software they develop.

Intellimation has published print, audio, video, and interactive multimedia materials since 1987.

The Intellimation Library for the Macintosh is a catalog listing more than 100 programs, most of them developed by educators for specific courses. Future editions of the catalog will have more titles, including interactive multimedia titles. All the programs have been reviewed by professionals to determine their clarity, accuracy, technical merit, and ease of use, and all come with a money-back guarantee. Some titles are available in both English and foreign versions.

Most of the programs in the catalog were developed by educators at highly regarded universities in the United States, Ireland, New Zealand, and Australia —and the catalog includes the educators' names. Others were developed by independent or commercial programmers, but all are designed for college and university use. Many of the programs can be customized for your particular needs.

The catalog is organized according to the following subject areas:

- Humanities and Languages
- Literacy
- Social Sciences
- Computer Science and Engineering
- Mathematics, Statistics, and Logic
- Life Sciences
- Physics, Chemistry, and Earth Science
- Tools and Utilities

Along with an illustration and a description of each program, the catalog lists the required amount of RAM and the recommended version of the Macintosh system software. Some of the programs require an additional program, such as HyperCard, Microsoft Excel, or SuperPaint; a few include a CD-ROM or videodisc, and therefore require a CD-ROM drive or videodisc player.

You can order programs from the catalog by mail, fax, AppleLink, or, in the United States, a toll-free telephone number. All programs in the catalog are copyrighted. Prices are reasonable, and there are several options for quantity purchases. For example, Lab Packs include ten copies of the software and one copy of the manual; site licenses are frequently available as well.

To order a free catalog, write or call:

Intellimation Library for the Macintosh
130 Cremona Drive
P.O. Box 1922
Santa Barbara, California 93116-1922
1-800-346-8355
1-800-3-INTELL
(in the United States)
(805) 685-8587 (in all other countries)

To inquire about having your program published in the Intellimation Library for the Macintosh, call Intellimation's Developer Line, at (805) 685-2100, and ask for a Developer's Kit.

HyperScreen from Scholastic Software

A new product from Scholastic Software brings some of the functionality of HyperCard to the Apple II world. The product is called HyperScreen, and it lets users easily create interactive "stacks." In HyperScreen vocabulary, a "stack" is a collection of related "screens" of information. A screen can integrate text, graphics, color, visual effects, sound, and video sequences. The creator of the stack is its "author," and the person who uses the stack for learning or entertainment is the "browser."

System Requirements

HyperScreen can run on any Apple IIe, IIc, IIc Plus, or IIGS computer, at least 128K of RAM and a floppy disk drive (either 5.25- or 3.5-inch). A joystick or mouse, a second disk drive, and a color monitor are recommended, but not necessary. Your stacks can be saved to any ProDOS®-formatted disk. HyperScreen is compatible with the Apple II Video Overlay Card.

The Package

The HyperScreen manual includes an introduction, a Getting Started section, a reference guide, a tutorial, and appendixes—all in a three-ring binder. Also included is a Teaching Guide, with tips on using HyperScreen in the classroom. Besides the program disk, you get two disks containing sample stacks, a help stack, backgrounds, borders, clip art, eight fonts, and sounds. The disks are not copy-protected.

Tools, Effects, Stacks, Screens, and Buttons

HyperScreen is definitely not a HyperCard clone—but it does include drawing tools, multiple fonts, a text editor with import capability, and a built-in controller for Pioneer LD-V 4200 laserdisc players. In addition to the graphics and sounds that come with HyperScreen, and those you can create, HyperScreen can import graphics created with Logo, BASIC, and drawing programs such as PrintShop and Slide Shop, and sounds created with Slide Shop, Melody Shop, and other programs. Authors can use dissolves, wipes, and fades to create simple animations.

A HyperScreen stack is a collection of up to 175 screens. Each screen is defined as either a text screen or a graphics screen. A screen can have up to 15 buttons, each labeled with either text or graphics. Users can create buttons that respond to a pointing device (mouse or joystick).

There are seven kinds of HyperScreen buttons. Link to Screen and Link to Stack buttons create the multiple paths that browsers can follow when they explore HyperScreen stacks. Each button can be a link to any other screen in the stack, or to the first screen in any other stack. Pop-up text buttons cause a small text window to appear, then to disappear after the user reads it. The Text Entry button lets the stack author pose a question, lets the browser type an answer, then reacts to the browser's answer. Sound/FX buttons play a sound clip—music, sound effect, or digitized speech—when clicked. The function of Multi-Buttons is to activate a list of other buttons, in a predetermined sequence.

If a Pioneer LD-V 4200 laserdisc player is connected to the computer, the Video Control button causes the player to display a predetermined still image or video sequence, either on a separate monitor or (if the Video Overlay Card is installed) on the Apple II monitor. Here's a sample video command sequence:

SA	start the player
FR50SE	go to frame 50
WA4	wait four seconds
500PL	play to frame 500
RJ	stop the player

Buttons can also be designated as Unclickable or Do On Opening. Do On Opening buttons are activated automatically when the screen opens, and may or may not be Unclickable.

Scholastic Software
P.O. Box 7502
2391 East McCarty Street
Jefferson City, MO 65102

Software from Scholastic
123 Newkirk Road
Richmond Hill, Ontario L4C 3GS
Canada

Q. What are the advantages of AppleTalk Phase 2?

A. The AppleTalk® Phase 2 networking system adds greater capacity and flexibility to AppleTalk networks. The principal feature is the ability to address up to 16 million nodes on a single Ethernet or Token-Ring extended network. AppleTalk Phase 2 users can now use EtherTalk® on a large Ethernet network without breaking the Ethernet into smaller networks of 254 nodes, as required by AppleTalk Phase 1. TokenTalk® users also appreciate this feature, since both Token-Ring and Ethernet support very large single networks using data link–layer bridges and repeaters.

To improve flexibility, more than one zone name can be associated with an AppleTalk Phase 2 network—an important feature for extended networks, because a single network can include hundreds of servers. Assigning more than one zone name allows servers to be placed in different zones, and the user is not confronted with an enormous list of servers when selecting a zone in the Macintosh Chooser.

Q. If I'm not concerned about the 254-node-per-network limitation in AppleTalk Phase 1, should I upgrade?

A. Yes. AppleTalk Phase 2 offers features that significantly reduce network traffic, including reduced broadcast traffic, reduced network traffic caused by routers exchanging routing tables, and best router selection.

Q. Should I upgrade to AppleTalk Phase 2 even if my network is quite small?

A. Yes. In the future, Apple and third-party companies will introduce products that assume you have upgraded to AppleTalk Phase 2. Apple will stop shipping products that support AppleTalk Phase 1 (for example, the AppleTalk Phase 2 Upgrade Utility and EtherTalk 1.2). If your network consists of all LocalTalk® nonrouter nodes, however, you don't need to upgrade.

Q. How do I upgrade to AppleTalk Phase 2?

A. To upgrade to AppleTalk Phase 2, upgrade all your routers and install new EtherTalk 2.0.x software on all your EtherTalk nodes. No change is required to LocalTalk nonrouter nodes. If it's not practical to upgrade all your routers and EtherTalk nodes at once, you can upgrade them incrementally. (For more information, see the *AppleTalk Phase 2 Introduction and Upgrade Guide,* which ships with the AppleTalk Internet Router.)

Q. Why aren't extended networks permitted on LocalTalk?

A. LocalTalk doesn't need extended networks. Because of the electrical specifications of LocalTalk cables, you can install at most 32 nodes on a single LocalTalk network. For more than 32 nodes, you can interconnect multiple LocalTalk networks via routers.

It is also less practical to upgrade LocalTalk users than to upgrade EtherTalk and TokenTalk users, because the LocalTalk driver is built into the ROM of every Macintosh computer and Apple LaserWriter® printer, while EtherTalk and TokenTalk are RAM-based drivers.

Q. Even though extended networks aren't implemented for LocalTalk, *routers* on LocalTalk must be upgraded to AppleTalk Phase 2. Why is that?

A. You must upgrade LocalTalk routers so that they can communicate with AppleTalk Phase 2 LocalTalk/EtherTalk or LocalTalk/TokenTalk routers on the network. If you don't upgrade all routers, you must use the AppleTalk Phase 2 Upgrade Utility (see the following question).

Another reason to upgrade LocalTalk routers is that AppleTalk Phase 2 LocalTalk routers generate less traffic than Phase 1 LocalTalk routers because they use the split-horizon technique.

Finally, Apple and third-party companies will introduce future network applications that assume you have upgraded all your routers.

Q. What does the AppleTalk Phase 2 Upgrade Utility do?

A. When an AppleTalk Phase 1 router exists on a network with Phase 2 routers, the AppleTalk Phase 2 Upgrade Utility translates packets—sent by an AppleTalk Internet Router to other routers—from AppleTalk Phase 2 packets into AppleTalk Phase 1 packets. The Upgrade Utility translates outgoing Routing Table Maintenance Protocol (RTMP), Zone Information Protocol (ZIP), and Name Binding Protocol (NBP) packets. (No translation is necessary on *incoming* AppleTalk Phase 1 packets because the AppleTalk Internet Router can understand those packets without the Upgrade Utility.)

The Upgrade Utility is necessary when users haven't had the chance to upgrade all their routers to AppleTalk Phase 2–compliant routers. When you use the utility, you cannot use network ranges or multiple zone names per network *anywhere on the internet*—a good reason to upgrade your network to full AppleTalk Phase 2 capability and remove the Upgrade Utility as soon as possible.

Note that the AppleTalk Internet Router does not need the AppleTalk Phase 2 Upgrade Utility when routing between two LocalTalk-based networks unless a Phase 1 router exists on one of the LocalTalk networks. Because the function of the utility is to allow the AppleTalk Internet Router to broadcast AppleTalk Phase 1 RTMP, ZIP, and NBP packets, the only time the AppleTalk Internet Router needs the utility is when an AppleTalk Phase 1 router is on the same physical cable as the AppleTalk Internet Router.

Q. If I have both LocalTalk and EtherTalk 2.0 users on my internet, do I need to run the Upgrade Utility? If I have both EtherTalk 1.0 and EtherTalk 2.0 nodes on my network, do I need to run the Upgrade Utility?

A. No, in both cases. The Upgrade Utility is necessary only when you have a combination of AppleTalk Phase 1 and AppleTalk Phase 2 *routers* on a network. LocalTalk and EtherTalk 2.0.x nodes can communicate through the AppleTalk Internet Router without running the Upgrade Utility.

To make sure EtherTalk 1.0.x and 2.0.x nodes can communicate, you can run both EtherTalk 1.0.x and 2.0.x software on a router. The router will accept packets from 1.0.x nodes and send them to 2.0.x nodes on the same Ethernet network. (The router needs to have only one EtherTalk card installed.) Note that this solution causes increased traffic on the Ethernet network because packets are re-sent; use it only temporarily while upgrading EtherTalk nodes.

Q. Is it possible to install AppleTalk Phase 2 on a nonrouter LocalTalk node?

A. Yes. To install AppleTalk Phase 2 on a LocalTalk node, install EtherTalk 2.0.x or TokenTalk 2.0 software (even if no EtherTalk or TokenTalk card is present). The installation puts a new AppleTalk file (Version 53) in the System Folder, and places some new resources in the System file of the LocalTalk node. When the node starts up, it loads the new resources into RAM and uses them instead of the LocalTalk driver in ROM. (You may then discard the EtherTalk or TokenTalk file in your System Folder.)

Q. Do LocalTalk users get any advantages from running the RAM-based AppleTalk Phase 2 driver?

A. Though LocalTalk users do not get any of the better-known AppleTalk Phase 2 features, such as extended networks or best router selection, they do get these two features:

- Name Binding Protocol wildcard support. The AppleTalk Phase 2 implementation of the Name Binding Protocol supports the ability to look for object or type names using the "≈" wildcard character, meaning "look for a match of zero or more characters." For example, "≈abc" matches "abc," "xabc," "xxabc," and so on. Similarly, "abc≈" matches "abcx," "abcxxxx," and so on.

- AppleTalk Transaction Protocol (ATP) enhancement. Though no changes were necessary to the ATP to support the architectural changes in AppleTalk Phase 2, flexibility was added to the ATP Exactly Once service. In AppleTalk Phase 2, the sender of a transaction request can tell the responder how long to wait before purging the request from the list of recently received transaction requests. Developers of higher-level protocols and applications find that such flexibility improves software performance, especially in very large AppleTalk networks.

Q. Will new machines have AppleTalk Phase 2 built into ROM?

A. Yes. The Macintosh IIfx computer, for example, has AppleTalk Phase 2 in ROM. Macintosh IIfx users can take advantage of the features mentioned in the previous question without installing any new software.

Q. We've heard that AppleTalk Phase 2 supports 16 million nodes. However, we've also heard such numbers as 1,024 networks and 255 zones. What are the actual AppleTalk Phase 2 architectural limitations?

A. The AppleTalk Phase 2 architecture supports 16 million nodes in an internet or in a single network. Theoretically, all 16 million nodes can be on a single Ethernet or Token-Ring network, with just one router present for the purpose of defining the network range. Even if no router is present, a single network can support approximately 65,000 nodes, because a special network range of 254 numbers is reserved for a network with no routers. In most cases, however, the 16 million nodes consist of multiple networks connected via routers. The AppleTalk Phase 2 architecture supports approximately 65,000 networks in an internet.

The AppleTalk Phase 2 architecture specifies that 255 zone names can be associated with any one Ethernet or Token-Ring network. Hence, the number of zones in a full internet could be 255 times 65,000, or approximately 16 million.

Q. Are these numbers realistic?

A. Probably not; due to memory constraints, router manufacturers must impose stricter limitations on the number of networks and zone names. You should follow guidelines in the Ethernet and Token-Ring specifications for the actual number of nodes per network and internet.

The AppleTalk Internet Router can support 1,024 networks in an internet. Each network can be an extended network identified by a network range. If there are more than 1,024 networks, the AppleTalk Internet Router will report a "routing table overflow" error. Though it's unlikely that most users will encounter this limitation, those who do encounter it should reconfigure the internet to reduce the number of networks.

The AppleTalk Internet Router can support 256 zone names in an internet. If there are more zones, the router's Zone Information Table overflows. It is similarly unlikely that users will encounter this limitation; if they do, they should consolidate the zones.

Q. I'd like more details about AppleTalk Phase 2. What should I read?

A. We recommend the following resources:

- *Inside AppleTalk* (published by Addison-Wesley and available from APDA® or from computer book stores. The second edition includes information on AppleTalk Phase 2).
- *AppleTalk Phase 2 Protocol Specification: An Addendum to Inside AppleTalk* (APDA order number C0144LL/A; not necessary if you have the second edition of *Inside AppleTalk*).
- *AppleTalk Phase 2 Introduction and Upgrade Guide* (ships with the AppleTalk Internet Router).
- Macintosh Technical Note #250 from Apple Developer Technical Support (available on the AppleLink network).
- *Macintosh AppleTalk Connections Programmer's Guide* (APDA order number M7056/A).
- The Tech Info Library on AppleLink (search for "AppleTalk Phase 2" to see relevant questions and their answers by Apple support engineers).

AppleTalk Routers: How and When to Use Them

This article explains basic router terminology and processes, and offers guidelines for using AppleTalk routers—particularly the AppleTalk Internet Router.

Terminology

Discussion of AppleTalk routers requires that certain basic terms be understood. *Internetwork* (or *internet*) refers to a set of networks that are joined to make one large network. Parts of an internet are sometimes referred to as *networks* and sometimes as *network segments*.

A *router* is a device that connects two or more networks, forming an internet. Routers enable workgroups to share information and network services, such as printers and electronic mail servers.

Each node on an AppleTalk network has a *node ID* that is automatically assigned when the device is turned on. In AppleTalk Phase 2, an AppleTalk network is identified by either a *network number* or a *network range* defined during the router setup process. A nonextended network, such as LocalTalk, is identified by a single network number; extended AppleTalk networks can be identified by a network range—a range of contiguous network numbers.

Hop is a unit of measurement that describes how many routers must be crossed to reach a destination. For example, a network device located on a network separated from yours by three routers is three hops away. A maximum of 15 hops is allowed by the AppleTalk protocols.

A *routing table* is a logical map of an internet maintained in each AppleTalk router. It is used to determine where a router should forward a data packet, based on the destination network number.

Bridges and Routers

The terms *bridge* and *router* are often used interchangeably, but there is a distinction. Bridges and routers connect networks at different levels. A bridge connects two networks using the data link layer, which provides transmission of data packets from one node on the network to another. A bridge is simply a network node that forwards packets to another part of the network; it joins network segments, causing the separate segments to become a single, larger network.

A router is a more complex device that can handle the network layer protocol functions, such as route calculation, packet lifetime control, and routing table maintenance. A router maintains a logical map of network segments, so that segments can retain separate network addresses. The partitioning of an internet into separate networks is a feature of routers that allows better allocation of shared resources.

While bridges allow extension of a single network, routers can be used to interconnect dissimilar networks into a single internet. In particular, routers can be used to enable communication between nodes on LocalTalk, EtherTalk, or TokenTalk LANs, thus forming an AppleTalk internet incorporating different technologies.

Internet Routers

An AppleTalk internet consists of one or more AppleTalk networks connected by intelligent nodes called *internet routers*. Internet routers should not be confused with *gateways*, which are nodes that separate and manage communications between different protocol families. Internet routers are packet-forwarding agents. Packets are sent between any two nodes of an internet by using a store-and-forward process through a series of internet routers. An internet router often consists of a single node connected to two or more AppleTalk networks; it might also consist of two nodes connected to each other through a communication channel. In the latter case, the channel between the two halves of the internet router could take any of the following forms:

- A leased or dial-up line
- Another network (for example, a wide area packet-switched or circuit-switched public network)
- A higher-speed broadband or baseband local area network used as a backbone

There are three ways in which routers can be used to build an internet, and a single router can incorporate all three configurations.

- Local routers: A router used to interconnect AppleTalk networks in close proximity is called a local router. Local routers are connected directly to each of the AppleTalk networks they serve. They are useful in allowing the construction of an AppleTalk internet with a large number of nodes within the same building.
- Half routers: The primary use of half routers is to interconnect remote AppleTalk systems. The intervening link can be made up of several devices (such as modems) and other networks (such as public data networks). Note that the throughput of half routers is generally lower than that of local routers, due to the generally slower communication link. Also, these communication links are often less reliable than the local networks of the internet.

- Backbone routers: Backbone routers are used to interconnect several AppleTalk networks through a backbone network. Although these routers might be placed in the local or half router category, they present an important set of properties. Each router could be a local router connected on one side to an AppleTalk network and on the other side to the backbone network. Another way of connecting a backbone router to the backbone network might be through a long-distance communication link. Typically, the backbone network either has a much higher capacity than the networks it helps interconnect or is a wide area network such as a public packet-switched datagram network.

Planning the Internet

Three situations commonly call for installing a router to create an internet:

- To connect two or more existing networks
- To enlarge a network that has reached its maximum length or number of devices
- To isolate traffic on different parts of a network

These three objectives are not mutually exclusive; the creation of an internet often involves several routers and may satisfy all of the above objectives.

- **Physical Layout**

The key to an expandable internet is a layout that supports growth while maintaining the most efficient route possible between any two networks—in terms of hops and speed.

—Create a map. Begin the internet planning process by creating a map of the desired internet layout. Using a copy of the floor plan as a background, draw in the networks and routers you need.

—Consider a backbone. The creation of backbone networks is one of the most useful tools available for designing an efficient internet layout. A backbone network is a network whose primary function is to transport information between other networks, which are connected to the backbone by routers. In the design plan of an internet, a backbone can help to create efficient routes between all parts of the internet. Each network connected to a backbone is no more than two hops from any other network connected to the backbone. It's advantageous to create a backbone network if many separate networks need to be connected to one another, or if networks that need to be connected are not physically contiguous.

- **Router Placement**

The following considerations for router placement can improve internet performance.

—Redundant routing: A router may be located anywhere along the network cable. Whenever possible, it's a good idea to create duplicate routes to each network segment. Redundant routing prevents network segments from becoming inaccessible to the rest of the internet in the case of a break on one access route. See the diagram on page 18 for an example of a redundant route layout.

—Backbone segments: Backbone network segments can improve network performance and integrity. They give each network segment equal access to every other segment, eliminating the need to pass through several segments on the way to a remote destination network. If a break should occur on any individual network (other than the backbone), other networks can maintain uninterrupted communication, independently of the inactive network. (See diagram on page 19.)

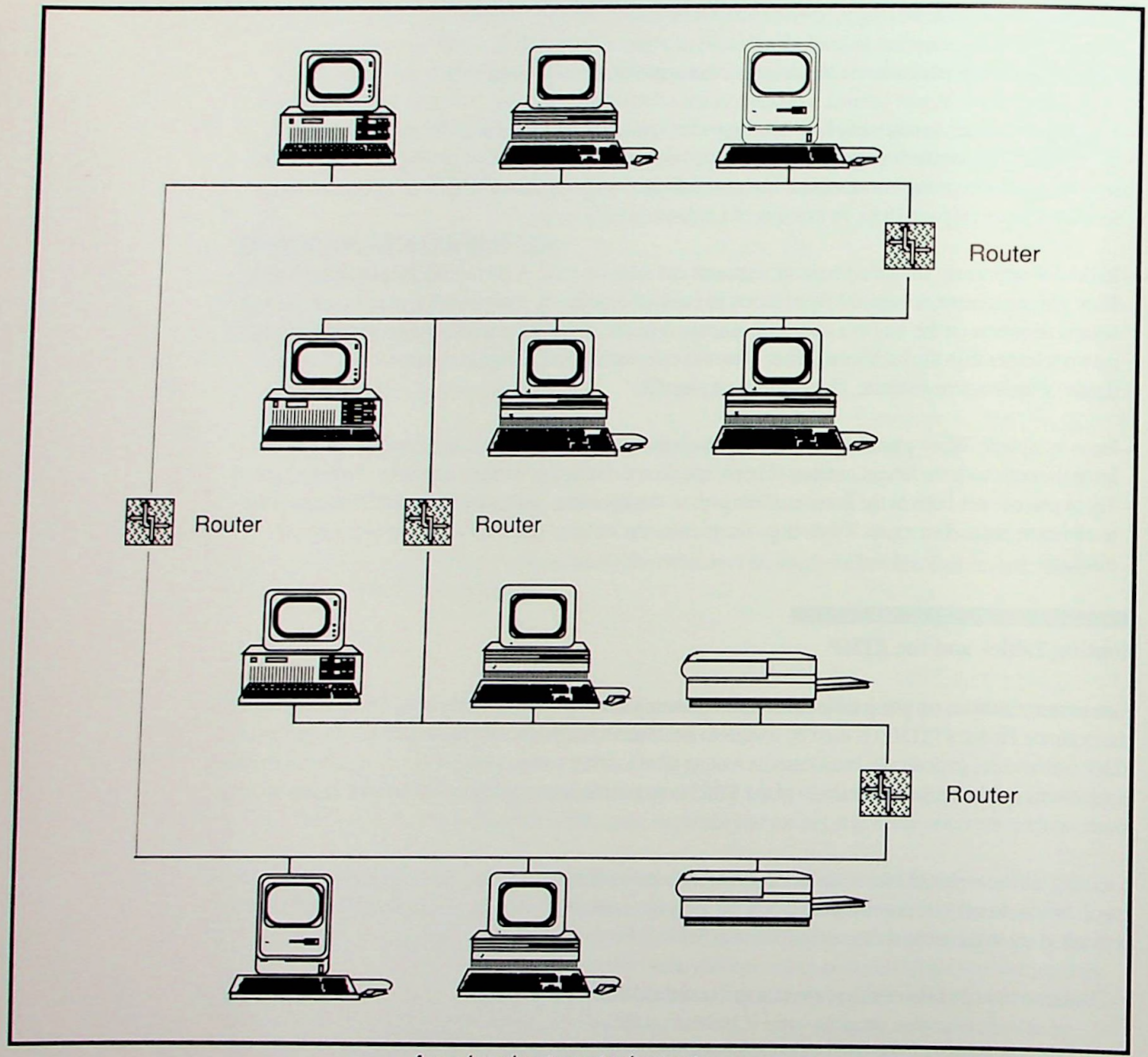
—Hops vs. speed: When planning an internet with networks of different speeds, keep in mind that routers favor the path with the fewest number of hops, and do not distinguish between networks of different speed. Try to place fewer hops in the faster-medium path so that the router selects the faster path. You may want to eliminate redundant routes if their hop counts cause the router to select a route going over a slower medium.

Routing Tables and the RTMP

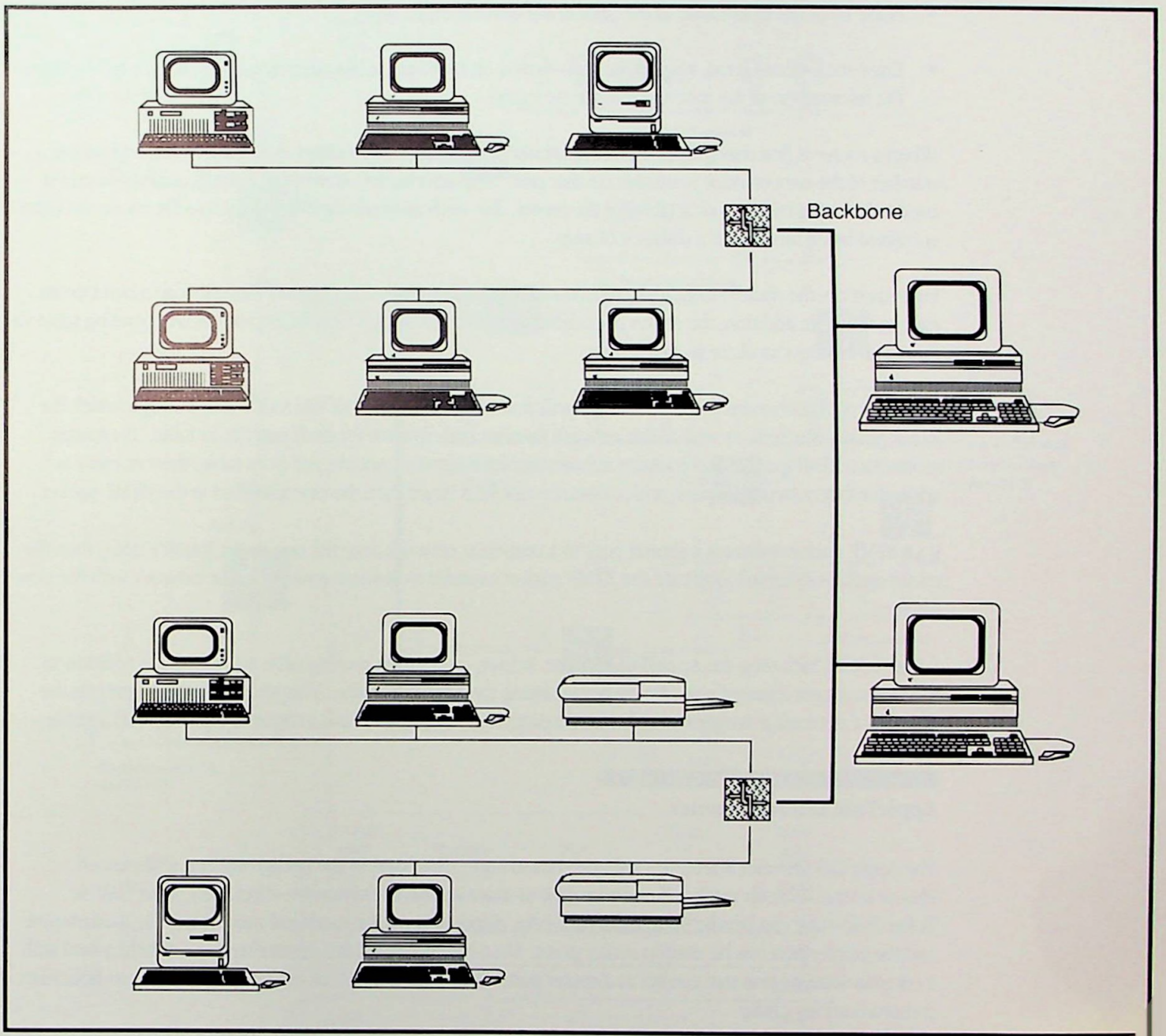
Each router maintains a routing table that it uses to determine where to forward packets. The Routing Table Maintenance Protocol (RTMP) is used by routers to establish and maintain their routing tables. Using the RTMP, each router periodically broadcasts its routing table to other routers so that they can update their tables. Nonrouters can also make minimal use of the RTMP to request their network numbers and the address of a router on their network.

A routing table consists of one entry for each reachable network in the internet. For each network, the table specifies how to get to that network and how far away the network is. (See diagram on page 21.) Each network entry in the table contains the following fields:

- Distance in hops between the current router and the destination network
- Router port number to be used to forward packets to that network



A redundant route layout



Network independence through backbone design

- Node ID of the next router in the path to the destination network

- Entry state value (good, suspect, or bad—based on how long it has been since an RTMP packet confirmed the information in the routing table for the entry)

When a router is first configured, the administrator enters information about each router port, such as the number of the network that is attached to that port. This information is saved in a configuration file and is used to form the initial routing table for the router. For each network directly attached to the router, an entry is created in the table, with a distance of zero.

From then on, the router periodically receives RTMP packets from other routers that allow it to build up its routing table. In addition, the router periodically broadcasts through each of its ports its own routing table so that other routers can share its information.

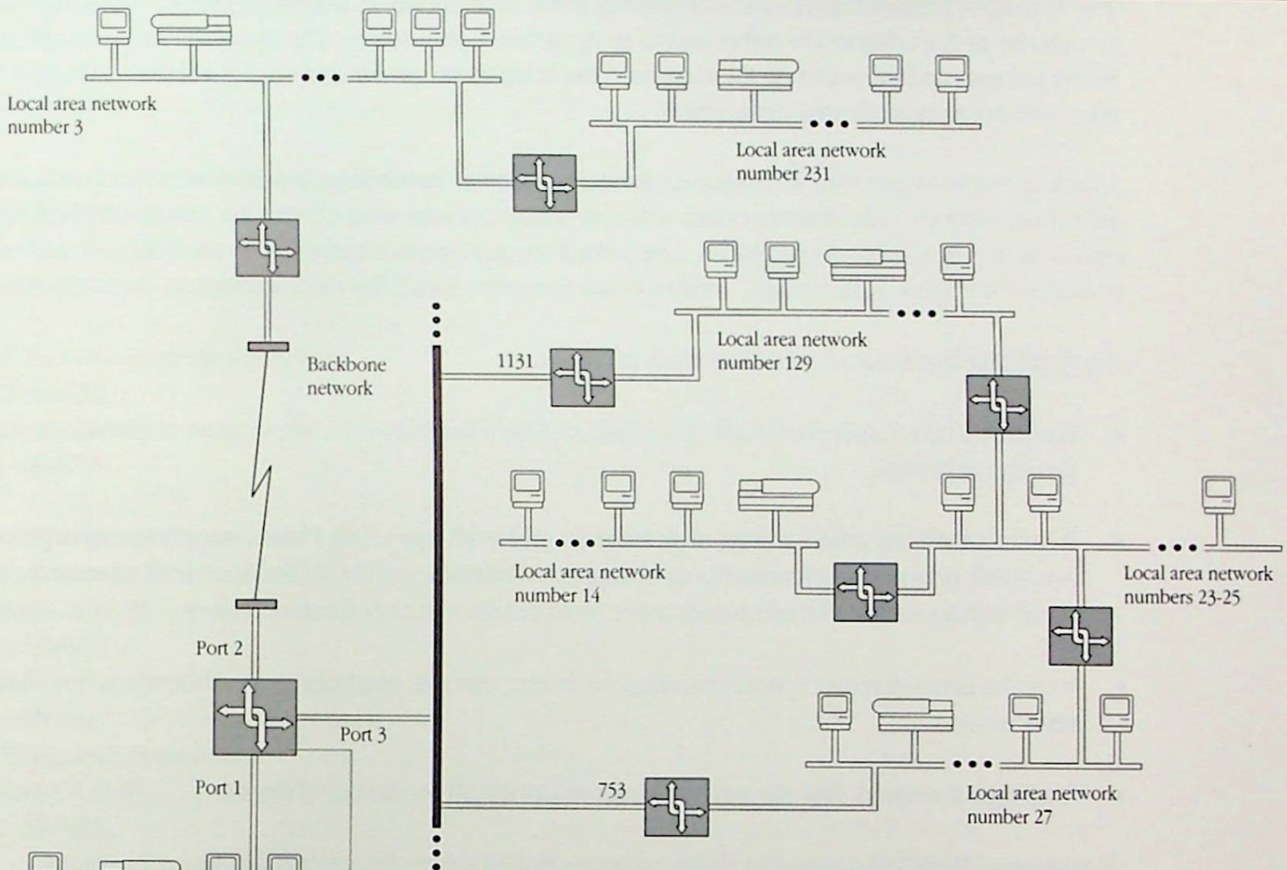
An RTMP packet contains the port node ID and port network number of the router port through which the RTMP packet was sent, as well as the network number and distance for each entry in its table. If a router receives an RTMP packet that contains information for a network not already in its table, then an entry is added for that network number, with a distance one hop larger than the one specified in the RTMP packet.

If an RTMP packet indicates a shorter path to a particular network than the one in the router's table, then the router updates its table to indicate the RTMP packet's sender as the next router for that network with the new distance.

Some routers, including the AppleTalk Internet Router, return their routing table on request, in addition to their normal procedure of periodically broadcasting their routing tables. This allows another router on the internet or network management software running on a nonrouter to ask a router to send its routing table.

AppleTalk Internet Router

The AppleTalk Internet Router is a software-based router than runs in the background on a Macintosh Plus or later Macintosh model. It connects two or more AppleTalk networks—LocalTalk, EtherTalk, or TokenTalk—and can handle up to eight networks, depending on the hardware used. Both the modem port and the printer port can be used as router ports. On a Macintosh SE, the expansion slot can hold a card with a communications port that can act as a router port. On a Macintosh II, all of the NuBus™ slots can hold such communications cards.



Network range	Distance	Port	Next IR	Entry state
3	1	2	0	Good
14	3	3	1131	Good
23-25	2	3	1131	Good
27	1	3	753	Good
106	0	1	0	Good
129	1	3	1131	Good
231	2	2	0	Good

Routing table

The AppleTalk Internet Router runs transparently in the background, so that the Macintosh acting as a router can also be an AppleShare® file server and/or an AppleShare print server. The use of the AppleShare File Server software and the router on the same machine is highly recommended, so that a separate Macintosh does not have to be dedicated to the router.

A desk accessory is provided for setting up the router software, monitoring its performance, and obtaining information about it. The desk accessory runs only on the machine where the router software resides, and is usually seen only by network managers. Users don't see any interface to the router; the only noticeable effect is access to services on other zones. Neither do users need to install any extra software to use the router.

The AppleTalk Internet Router has four main purposes:

- It connects two or more LocalTalk, EtherTalk, or TokenTalk networks, allowing users access to services on other networks.
- It isolates traffic on different parts of an internet. Although AppleTalk Phase 2 supports very large single AppleTalk networks, performance can be improved by using a router to break up such a network. The router isolates local traffic and passes traffic on to the internet only when necessary.
- It creates zones that conceptually partition the internet, so that users can more efficiently access shared services.
- It enlarges a network that has reached its maximum length or number of devices.

Upgrading an AppleTalk internet to Phase 2 requires that all routers be upgraded to Phase 2 versions.

Third-Party Routers

Following is a partial list of companies that provide AppleTalk routers with varying feature sets to support AppleTalk Phase 2.

APT Communications, Inc.
9607 Dr. Perry Road
Ijamsville, MD 21754
1-800-842-0626

Cayman Systems
1 Kendall Square, Building 600
Cambridge, MA 02139
(617) 494-1999

Cisco Systems
1350 Willow Park Road
Menlo Park, CA 94025
(415) 326-1941

Hayes Microcomputer Products, Inc.
P.O. Box 105203
Atlanta, GA 30348
(404) 449-8791

Network Resources Corporation
2450 Autumnvale Drive
San Jose, CA 95131
(408) 263-8100

Nuvotech, Inc.
2015 Bridgeway, Suite 204
Sausalito, CA 94965
(415) 331-7815

Shiva Corporation
15 Second Street
Cambridge, MA 02141
(617) 864-8500

Data Recovery: Q&A

Q: Is there a way to recover deleted files on an Apple II under the Apple DOS 3.3 and ProDOS operating systems?

A: Central Point Software offers Copy II Plus, a product that includes a utility for restoring deleted files in both DOS 3.3 and ProDOS formats, as long as you have not written data to the disk since the file was deleted. Copy II Plus Version 9 contains the following programs:

- A DOS/ProDOS disk utility package
- A bit-copy program for 5.25-inch disk drives
- A bit-copy program for 3.5-inch disk drives

In addition to restoring deleted files, Copy II Plus utilities help you compare files, alphabetize and sort your catalog, select and run applications directly from the main menu, format disks, verify drive speeds, and make archival backups of both copy-protected and nonprotected software.

You can select ProDOS applications and run them from within the Copy II Plus program, returning automatically to Copy II Plus when you've finished with an application. The program allows you to detect any differences between two files, keep track of the total number of mismatched bytes, and display the information on the screen. It also supports disk mapping of disk drives of any size.

To use Copy II Plus, you need an Apple IIe Enhanced with an 80-column card, an Apple IIc, or an Apple IIGS computer. You need a minimum of 128K of RAM and one disk drive. The product supports any ProDOS-compatible RAM card. (Note that Apple UniDisk™ 3.5-inch drives and Apple IIc Plus internal drives do not support the bit-copy portion of the product.)

For more information, contact Central Point Software, as follows:

Central Point Software, Inc.
15220 N.W. Greenbrier Parkway, #200
Beaverton, OR 97006
(503) 690-8090

Q: The directory of the ProFile™ hard disk that I use with my Apple IIGS has been corrupted. I need access to this data; what can I do?

A: In the Apple IIGS, higher "noise" from the bus passes on to the ground traces on the ProFile interface card and can corrupt the directory of the ProFile, making it invisible to ProDOS and inaccessible to the user. Before you consider using a ProFile with an Apple IIGS, you need to address three equipment issues:

- Your ProFile interface card must have ROM part number 341-0299, Rev. B.
- Your Apple IIGS system must have ROM Version 01 or later.
- Your ProFile interface card must have been properly modified by an authorized Apple service provider. A jumper should be installed to ensure correct operation of the ProFile when used with the Apple IIGS. Don't try to repair a directory with an unmodified ProFile card; the lack of the jumper is the usual cause of a corrupted directory.

When you're sure that your card has the proper modification, you can use a disk editor program, such as the ProDOS MLI Exerciser program described in the following procedure, to recover the directory.

1. Run the ProDOS Machine Language Interface Exerciser program (included with the *ProDOS Technical Reference Manual*) with the DASH (-) command and wait for the main menu.
2. From the main menu, type 80 and press Return to command a read of a block; then enter the following values from the screen:

Parameter Count	$03	(Default)
Unit Number	$50	(The ProFile card's slot followed by a zero)
Data Buffer	$00	(This value is where the block to be modified will be loaded)
	$40	
Block Number	$02	(This is the bad block to load)
	$00	

After typing in each pair of numbers, press Return to go on to the next entry prompt. After pressing Return for the last entry, you see the following message:

```
PRESS RETURN TO EXECUTE COMMAND
```

When you press Return, you see another message:

```
Error $00: Call Successful
```

Press Return again to go the main menu.

3. Type M and Return to modify the buffer. The default should read:

```
$00
$40
```

This is the correct setting; press Return at each entry and then press it once more to go on to Modify mode. You see a table of numbers and a blinking cursor on the entry you need to delete: number 55. Press the Escape key to go to the main menu.

Note that if "55" was not in the first position of the table, the directory recovery procedure won't work. If "55" was not shown at all, your ProFile may not be operating for a reason other than a corrupted directory.

4. Type 81 and press Return to write the block to the disk. Press Return to move through the number entries until you reach the data buffer entry. Change it to look like this:

```
$01
$40
```

Continue to press Return through the block number entries, and then press it once more to command the actual block write. You see the following message:

```
Error $00: Call Successful
```

5. Restart your system and check to see that the ProFile is now recognized. All of the previously inaccessible data should now be usable.

For more information about using the ProDOS MLI Exerciser Program, see the *ProDOS Technical Reference Manual.*

Q: Using the DOS version of AppleWriter™ II, I unintentionally saved a short text file over a longer text file. I know that the data from the original file is still on the disk, but I can't get to it. How can I retrieve it?

A: The following program accesses the data so that the system can recover your original file. It works with standard DOS text files (distinguished by a "T" in the left margin of the catalog listing). The program doesn't work with the ProDOS version of AppleWriter.

```
10  TEXT : NORMAL : HOME
20  INPUT "ENTER THE FILE NAME TO BE READ ";F$
30  INPUT "FIRST BYTE TO READ ";C
40  ONERR GOTO 200
50  D$ = CHR$(4)
60  PRINT D$"OPEN "F$",L1"
70  PRINT D$;"OPEN NEW";F$
80  B$ = ""
90  PRINT D$;"READ "F$",R";C
100  GET A$
110  C = C + 1
120  IF (ASC (A$) = 13) GOTO 170
130  B$ = B$ + A$
140  PRINT
150  IF (LEN (B$) > 254) GOTO 170
160  GOTO 90
170  PRINT : PRINT D$;"WRITE NEW";F$
180  PRINT B$
190  GOTO 80
200  PRINT : PRINT D$;"CLOSE ";F$
210  PRINT D$;"CLOSE NEW";F$
220  END
```

1. Type in the program, save it on your DOS disk by typing "SAVE (file name—whatever you name the program)," and run it by typing "RUN (file name)."

2. When the program requests the name of the file to be recovered, enter the name, giving slot and drive specifications if necessary. For example: `MYFILE, S6, D2`.

3. The program prompts you for the first byte that you want to read from the file. You type in an integer between 1 and 32,768 that denotes the size, in bytes, of the file that was accidentally saved, plus 1.

   Open the file you saved accidentally to find its size; the size of the file is displayed on the data line after the length entry, "Len." Add 1 to the count and type in the sum.

4. After you have entered your information, give the program time to run and to write the entire file; the program accesses the drive several times. The cursor appears on the screen when the program is finished, and the original file has been recovered and saved with the file name "NEW." You should now change the file name to something other than "NEW" to avoid its being overwritten by another "NEW" file.

HyperCard AppleTalk Toolkit

Thanks to Donald Koscheka and Willi Powell for contributing this article, which was originally published in TechBeat, *a publication of Apple Canada.*

AppleTalk is a powerful, easy-to-implement local area networking system that allows several computers to share information and peripherals. While AppleTalk local area networking has been an intrinsic feature of the Macintosh computer since its introduction, few programmers and developers have had enough exposure to networking concepts to fully understand programming with AppleTalk.

When Apple introduced HyperCard, the program did not support such communications facilities as the serial port and AppleTalk. This was not an oversight; the extensible nature of HyperCard allows developers who need these capabilities to add them themselves.

The HyperCard AppleTalk Toolkit, available from the APDA organization, provides everything you need to use the AppleTalk Transaction Protocol (ATP) and AppleTalk Name Binding Protocol (NBP) from within HyperCard. It includes a set of external commands (XCMDs) and external functions (XFCNs) that extend HyperCard to allow access to ATP and NBP facilities.

The AppleTalk Toolkit includes the following:

- RemotePaint is a HyperCard stack that demonstrates the use of the AppleTalk Toolkit. You can run it on two or more Macintosh computers in the same AppleTalk zone, and drawings made on any of the systems will also appear on the others. With only a bit of scripting, you can make drawings and send HyperCard messages to any of the Macintosh computers running RemotePaint.

- HyperStation is a stack that lets you explore the toolkit functions. It is not a stand-alone application; rather, it allows you to explore the various XCMDs and XFCNs and to discover how they operate.

- *Inside HyperAppleTalk* is a document that describes the toolkit XCMDs and XFCNs in full detail. It also provides an introduction to the AppleTalk protocols supported by the toolkit. This document is a small subset of *Inside AppleTalk,* published by Addison-Wesley.

- The ATP folder contains the source code for the AppleTalk Transaction Protocol XCMDs and XFCNs.

- The NBP folder contains the source code for the AppleTalk Name Binding Protocol XCMDs and XFCNs.

- The MISC folder contains source code used in both the ATP and NBP XCMDs and XFCNs.

How It Works

The AppleTalk Transaction Protocol assumes that some nodes on the network are information providers, some are information requesters, and others are both providers and requesters. Before beginning a session, you must do the following for each node:

- Determine whether to open up a listening socket. Only servers need listening sockets. A socket remains assigned as long as you remain connected to the network.

- Register the name of the node entity. You can use any name you want. If you don't want to pick an entity, a default will be assigned when you register. Your entity will have the name found in the Chooser, your type will be HyperPeople, and your zone will be the one in which your Macintosh is located.

- Register the node with the network. Using a unique address allows other entities to see your node and call it by name.

- Look up all the other entities on the network. Doing a lookup enables you to refer to other entities by name. If no names are returned to you, there are no other entities on the network.

If a node is a server, it now waits for clients to start asking questions. If a node is a client, it can now start sending requests to other clients.

Each computer running an AppleTalk stack must have several handlers in the stack script that initialize AppleTalk and open communications to other computers. (It is also possible to use the background or card script; if you try this, remember to close the network connection when you leave the background or card.)

Sending commands is straightforward, and you can send them to specific names or to everyone. Use the ATPSendRequest XCMD to send valid HyperTalk® commands to the other workstations. The following script shows a very simple example.

```
on mouseUp
   — make all the HyperCard Stations BEEP then BOING
     global audience, global responsedata,
       globalreceivedata
     atpsendrequest audience, "Beep"
     atpsendrequest audience, "play"
       && quote & "boing" & quote
end mouseUp
```

Once the command is sent, IDLE and HyperTalkMessage handlers in each of the HyperStations do the work of receiving and dispatching messages in the individual stacks.

```
on idle
    global globalreceivedata, globalresponsedata, audience
    atpReceive "HyperTalkMessage" calls the HyperTalkMessage Handler
end idle

on HyperTalkMessage
    global globalreceivedata, globalresponsedata, messages
      put messages & globalreceivedata & return into messages
      if "choose browse tool" is in globalreceivedata
      then repeat with i=1 to the number of lines in messages
        -send the HyperTalk commands to HyperCard
          send line i of messages
        end repeat
      put empty into messages
    end if
  put empty into globalresponsedata
end HyperTalkMessage
```

Remote Control Application

RemotePaint is a perfect starting point for remote control of other Macintosh computers. The following two examples demonstrate the usefulness of HyperCard remote control.

- In a classroom, student stacks can be linked to a teacher's stack so the teacher can lead the students through the stack. Such stacks can be lessons, tests, or simple demonstrations. (See Figure 1.)

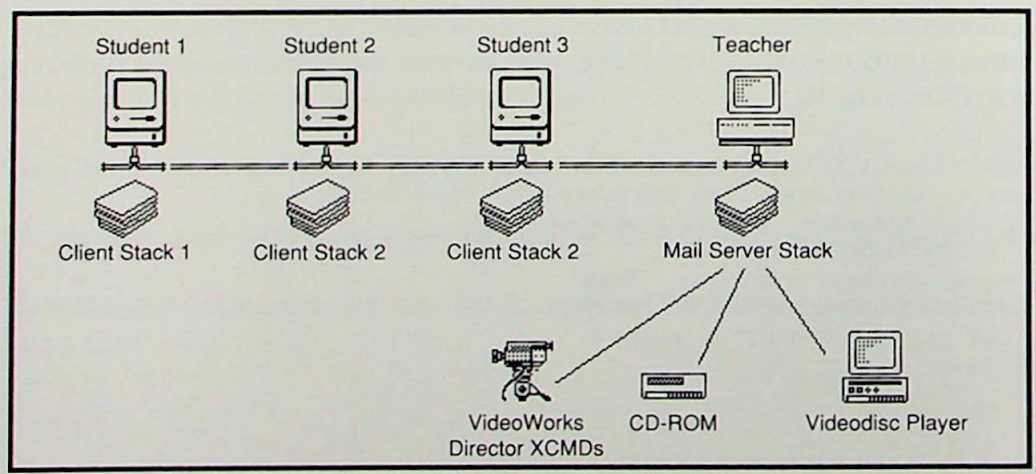


Figure 1: HyperCard remote control in a classroom environment

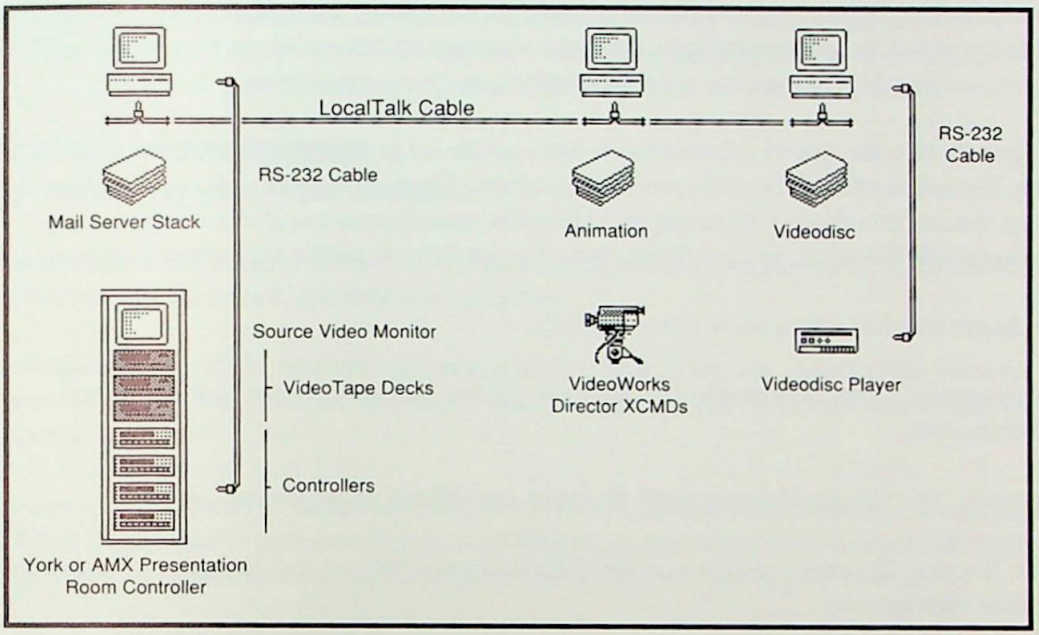


Figure 2: Apple Canada's EBC and HyperAppleTalk

- As a real-life example, the Apple Executive Briefing Centers use three Macintosh computers to control presentation devices, with the advantage of great flexibility. Macintosh 1 uses the HyperCard AppleTalk Toolkit and the Serialport tools to run the room controller (lights, projectors, slide show, all eight video sources, and the two other Macintosh computers). Macintosh 2 is dedicated to running presentation animations, and uses only MacroMind Director X-Objects. Macintosh 3 is dedicated to running the videodisc player, which uses another of the Apple XCMDs available from APDA, the Videodisc Toolkit. Macintosh 1 can exchange commands with the room controller and the other Macintosh computers, and the configuration as a whole makes a dynamic presentation environment. (See Figure 2.)

Tips for Using the AppleTalk Toolkit

Keep these tips in mind for smoother use of the HyperCard AppleTalk Toolkit:

- Make sure the Chooser name is set to the desired name. The default name given to a node is the Chooser name; however, it is possible to specify a different name.
- HyperCard performance can be slower over the network. To optimize performance, keep the idle loop as small and simple as possible.
- Experiment with RemotePaint—it is a simple and powerful starting point.

Apple Multivendor Network Solutions Guide

The multivendor computing environment has become common in most large organizations. To help you operate successfully in such environments, Apple provides solutions that enable you to access the information you need, use it in the way you want, and share it with others in your organization.

The *Apple Multivendor Network Solutions Guide,* first available last year, has been significantly expanded to include descriptions of more than 300 connectivity products. The guide includes sections on the AppleTalk network system, network application tools for multivendor environments, and Macintosh connectivity to the IBM, Digital, MS-DOS, UNIX, Tandem, Wang, Prime, Hewlett-Packard, and Unisys computing environments.

Each chapter includes sections on the following topics:

- Environments: Offers an overview of the networking architecture used by particular computing environments.
- Solutions: Describes how to integrate the Macintosh into different environments.
- Case histories: Illustrates real-life integration of the Macintosh computer and third-party solutions into various environments.

The *Apple Multivendor Network Solutions Guide* is available through your authorized Apple reseller or Apple sales representative.

Sharing Files Among Computers

Many schools and other organizations are interested in sharing files among various combinations of Macintosh, Apple II, and IBM PC-compatible computers. This article discusses methods of sharing files among computers, and suggests a number of Apple and third-party products that may be helpful.

Using AppleWorks Files on the Macintosh

To convert Apple II files to the Macintosh format, you can use Apple File Exchange (AFE), which comes with Macintosh System Software or Works to Works Transporter.

The procedure is to launch the translation program, insert the Apple II data disk, and select the files to be transferred to the Macintosh. Files are converted to Macintosh text files that can be used with a variety of Macintosh applications.

When used with AFE, Works to Works converts AppleWorks® spreadsheet, word processor, and database files (on 3.5-inch floppy disks) to corresponding Microsoft Works files. It is included with the Microsoft Works package, and is also posted on many on-line bulletin board services and may be given away freely.

To use Works to Works, your AppleWorks ProDOS files must be on 3.5-inch floppy disks. After starting Apple File Exchange on the Macintosh, insert the ProDOS disk with your AppleWorks files into the Macintosh 3.5-inch disk drive. Then select the files you want to convert, click the transfer option, quit AFE, and launch Microsoft Works to read your new files.

Using MS-DOS Files on the Macintosh

To use MS-DOS files on the Macintosh computer, you can use DOS Mounter software from Dayna Communications (with the Apple SuperDrive™ floppy disk drive and AFE), or MacLink*Plus* and MacLink*Plus*/Translators from DataViz.

- DOS Mounter allows the SuperDrive to provide support for MS-DOS disks at the Macintosh Finder™ level. Ordinarily, with SuperDrive, MS-DOS disks don't appear on the desktop in the same way that Macintosh disks do; they are normally visible only through the use of AFE. With DOS Mounter in your System Folder, an MS-DOS disk inserted in the Macintosh SuperDrive appears on the desktop and behaves just as a Macintosh disk does. You can copy files, documents, and applications to and from the disk and drag items to the Trash. The only restriction is that you must use Apple File Exchange Version 1.1.1 (included on the DOS Mounter disk) to erase a disk and format it in the MS-DOS format.

- MacLink*Plus* is file transfer and translation software that allows you to exchange files between Macintosh computers and a variety of MS-DOS environments. A Macintosh disk, a PC disk, and built-in communications software allow you to connect your Macintosh to a PC serial port using the included cable. Access is provided to PC disks, directories, and files. Compatible MS-DOS devices include a local IBM PC that is connected to the Macintosh modem or printer port using the included RS-232 serial cable; a remote IBM PC that is connected to a Macintosh via modems, remote disks, or volumes made available to the Macintosh desktop by an AppleTalk-connected server or other network product; or a Macintosh MS-DOS-compatible disk drive. MacLink*Plus* includes a set of translators, an interface cable for connecting a Macintosh to an MS-DOS computer, and interface software.

  MacLink*Plus*/Translators is a complete library of file translators that convert to or from file formats such as MacWrite, Microsoft Word, Microsoft Excel, Lotus 1-2-3, WordPerfect, DCA, and many more; the product includes more than 50 file translators that provide an easy means of exchanging files while retaining formats and formulas. MacLink*Plus*/Translators is available as a stand-alone product and is also included with each member of the MacLink*Plus* family of connectivity products. You can use MacLink*Plus*/Translators with MacLink*Plus* or with your own copy of Apple File Exchange.

Using Apple II Files on the IBM PC

Cross-Works 2.0 from SoftSpoken provides Apple II users with MS-DOS compatibility by allowing them to work on a document in AppleWorks and transfer it to WordPerfect on an MS-DOS machine, with the formatting intact. You can also transfer spreadsheets into Lotus 1-2-3 format, or databases into dBASE III, III Plus, or IV format. All three functions transfer into Microsoft Works format. In fact, you can transfer Apple II files into any MS-DOS-compatible application that reads a Lotus, dBASE, or Microsoft Works file format. The transfer works both ways; you can also receive files from the MS-DOS environment. (For more information, see the August–September 1990 issue of the *Apple II Technical Bulletin*.)

Using MS-DOS Files on the Apple II

The PC Transporter from Applied Engineering allows Apple II users to run MS-DOS software. It includes a full-length expansion card that fits into an expansion slot on the Apple II logic board. Included cables link the card to specific connectors on the logic board. PC Transporter acts as a universal disk drive controller, enabling your Apple 3.5-inch drive to run MS-DOS or ProDOS applications and to switch immediately from one type of application to the other. Apple disk drives and printers can remain attached in the normal manner, as can most types of monitors. Switching between MS-DOS and Apple ProDOS is easily accomplished through PC Transporter's main menu.

Sharing Files via the AppleShare File Server

With the AppleShare file server system, you can share files among Macintosh, Apple II, or IBM-compatible computers. For example, an AppleWorks user can store a spreadsheet as a text file on the server, and a Macintosh user can use the data in Microsoft Excel, or a PC user can use it in Lotus 1-2-3.

Third-party products can be used to enhance network file sharing in the following ways:

- Macintosh and PC users can share mail services via products such as Microsoft Mail or QuickMail from CE Software.

- Macintosh and PC users can share a networked modem using a Shiva NetModem V.32, which lets an entire AppleTalk network of users share a modem just as they share a LaserWriter printer. Because the NetModem is a stand-alone device, it doesn't require a dedicated Macintosh; you plug it in anywhere on the network using a regular AppleTalk or PhoneNET connector, plug in the phone line, and install the NetModem software.

  The NetModem product also allows you dial into the network from a remote site. Using two NetModem V.32 devices allows you to bridge remote networks over ordinary dial-up phone lines. Once connected, the two networks can share file servers, electronic mail, and peripherals.

- Macintosh users can access other AppleShare networks via the Shiva TeleBridge product. Two networks, each equipped with a TeleBridge and a modem, can be connected via phone lines to form a single global internetwork, even if they're thousands of miles apart. Any locally networked Macintosh can connect to a distant network through a TeleBridge and modem at speeds of up to 57,600 bps. The TeleBridge and modem can also be shared by all Macintosh computers on the network for access to on-line services, or for other modem communications, just as though each Macintosh had its own modem.

  The TeleBridge also provides dial-in access to a single Macintosh with a modem, permitting remote users to access printers, file servers, e-mail, or any other network resource as though they were directly connected to the network.

  The TeleBridge Internet Manager software allows you to manage an internetwork from any Macintosh in the system. You can group networks into zones, control traffic, and restrict access between zones.

- Apple IIGS users can connect to an AppleShare network using the InterBridge, from Hayes Microcomputer Products, for dial-in service. The InterBridge allows two networks—each equipped with an InterBridge, a Hayes Smartmodem, and a Macintosh computer—to access each other through either dial-up or leased telephone lines. For more information, see the August–September 1990 issue of the *Apple II Technical Bulletin*.

- From a Macintosh, you can observe or control another remote Macintosh over a dial-up telephone line via Timbuktu/Remote from Farallon. Timbuktu/Remote can also transfer files and allow you to "chat" with another user. With the ability to observe or control a remote computer, you can assist users in other locations with applications and procedures. The product can also put you in touch with a remote local area network, allowing access to networking, sharing files, or using e-mail.

  In addition, Timbuktu/Remote can be used to troubleshoot problems at another location. Over the phone, the network manager can control a computer or server on the distant network and use a full range of network management tools to solve problems and support users.

  Used in conjunction with Timbuktu software (a separate product), groups of users can collaborate from remote locations in real time using any Macintosh on the network, just as though everyone were gathered around the same computer; people can work together on designs, word processing documents, spreadsheets, or any other type of Macintosh application.

- Macintosh users can control remote-network PC computers with pcMACTERM and pcMACTERM II/Network from DMA. pcMACTERM II provides Macintosh-to-PC bidirectional file transfer. It also allows a Macintosh to control a PC host remotely, running all the PC's DOS software and peripherals. pcMACTERM II/Network allows any PC or Macintosh on an AppleTalk network to exchange data and transfer files with other systems on the network. The software allows a Macintosh to control a remote PC host that is connected to the same network, run its software and peripherals, and use its connections to a PC LAN or mainframe.

- All network users can access remote mainframes with the appropriate terminal software.

Product Information

For more information about the products described in this article, contact the publishers as follows:

Applied Engineering
P.O. Box 798
Carrollton, TX 75006
(214) 241-6060

DataViz, Inc.
35 Corporate Drive
Trumbull, CT 06611
(203) 268-0030
Fax: (203) 268-4345
AppleLink: D0248

Dayna Communications
50 South Main Street, Fifth Floor
Salt Lake City, UT 84144
(801) 531-0203

DMA, Inc.
1776 East Jericho Turnpike
Huntington, NY 11743
(516) 562-0440
Fax: (516) 462-6652

Farallon Computing, Inc.
2201 Dwight Way
Berkeley, CA 94704
(415) 849-2331
Fax: (415) 841-5770

Hayes Microcomputer Products, Inc.
P.O. Box 105203
Atlanta, GA 30348
(404) 449-8791

Shiva Corporation
155 Second Street
Cambridge, MA 02141
1-800-458-3550

SoftSpoken, Inc.
P.O. Box 18343
Raleigh, NC 27619
(919) 870-5694
Fax: (919) 870-5696

Happy Holidays! December Issue Includes *Apple II Guide* and 1990 HyperCard Stack

With the October–November issue, subscribers to the *Education Technical Bulletin* received a HyperCard stack containing all Technical Bulletin articles from 1988 and 1989. Articles from 1990 were to be included with the February–March 1991 issue. However, the 1990 stack is ready early, and has been included with this month's issue.

We have also included a complimentary copy of the new *Apple II Guide*, a comprehensive 240-page resource book designed to support current and future users of all Apple II equipment. The guide covers innovative applications, technical issues, communications strategies, troubleshooting, product information, and sales and service information. Additional copies are available from your authorized Apple reseller or local user group.

We hope the *Apple II Guide* and the stacks of past issues prove to be valuable support resources for you and your organization.

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